Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

2
Ag 52

THE NORTHERN REGIONAL RESEARCH LABORATORY
ITS PURPOSE, ORGANIZATION, AND ACHIEVEMENTS

PEORIA, ILLINOIS

R. T. Milner, *Director*

BUREAU OF AGRICULTURAL AND INDUSTRIAL CHEMISTRY
AGRICULTURAL RESEARCH ADMINISTRATION
UNITED STATES DEPARTMENT OF AGRICULTURE

AIC-243

JULY 1949

PURPOSE AND ORGANIZATION

In 1938 Congress authorized and directed the Secretary of Agriculture to establish, equip, and maintain four regional research laboratories--one in each major farm area. The purpose of these laboratories is to develop new scientific, chemical, and technical uses and extended markets and outlets for farm commodities, their products and byproducts.

The four Regional Research Laboratories are under the administration of the Bureau of Agricultural and Industrial Chemistry. In addition to the four Laboratories, the Bureau includes a number of smaller research groups.

The Bureau is in turn one of the seven research bureaus which constitute the Agricultural Research Administration. Through the Administration, the scientific investigations of the United States Department of Agriculture are coordinated, and working relationships are maintained with the State Agricultural Experiment Stations.

These four laboratories--completed in 1940-41--are known as the Northern, at Peoria, Ill.; the Southern, at New Orleans; the Eastern, at Philadelphia; and the Western, at Albany, Calif. The research undertaken at each of the laboratories is centered on those commodities dominant in their respective regions.

The Northern Regional Research Laboratory, whose area embraces Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, the Dakotas, Ohio, and Wisconsin, is working on three groups of commodities: Cereal crops, especially corn and wheat; oilseed crops, particularly soybeans; and agricultural residues, such as straw, corncobs, hulls, husks, and the like.

The organization for research at the Northern Laboratory is based essentially upon the important components of the commodities being studied, rather than on the commodities themselves. Thus it is possible to use the research staff most efficiently and avoid duplication of work.

The Laboratory staff consists of approximately 300 persons, more than half of whom are scientists and technicians. The Laboratory is a U-shaped structure of three stories and a basement, with separate storage buildings and a power plant. The main building is divided into an administrative unit forming the base of the U, and containing the divisions or offices which provide general administration and other services for the entire Laboratory, as well as the Peoria branch of the Department of Agriculture Library; a chemical laboratory unit, containing some 75 research laboratories; and an industrial laboratory unit, or pilot plant, for process development on a scale sufficiently large to determine the economic feasibility of producing new or improved products which have successfully passed the "test tube stage" of experimentation. The industrial unit includes an experimental fermentation plant in which about 500 gallons of anhydrous alcohol or other solvents can be produced per day, and a motor fuel testing laboratory for evaluating alcohol and other liquids.

Utilizing farm commodities to their fullest extent may often be accomplished by processes employing fermentation. Molds, yeasts, and bacteria have an important part in the Laboratory's research. The Culture Collection, consisting of more than 5,000 strains of industrially important micro-organisms is one of the largest in the world. It provides strains for intensive investigation in the search for new antibiotics, vitamins, enzymes, organic acids, solvents, and other valuable products.

The production of alcohol by the fermentation of grains and its use as a fuel in internal combustion engines appears to be the most promising large-scale industrial outlet for surplus grains. This problem, therefore, is being given special attention.

Another of the facilities for research is the semi-works plant of the Synthetic Liquid Fuels Project, in which sugars are obtained from agricultural residues for conversion to liquid fuels. Corncobs is the first of the residues being studies--the method of their conversion being one developed by this Laboratory's chemists, engineers, and fermentologists.

ACHIEVEMENTS

All the achievements of the Northern Laboratory cannot be reviewed here, but the following list of developments, many of which have already been accepted by industry, indicate the type and scope of the research conducted. Moreover, they show the route taken toward discovery of new uses for agricultural commodities and byproducts, how these accomplishments are opening up new markets, and the extent to which many of the products are contributing to our well-being.

Penicillin.- Fundamental research at this Laboratory during 1941-1945 made possible the commercial production of penicillin and provided the foundation for a large and expanding new industry. Benefits to man in terms of lives saved and suffering alleviated by this antibiotic are incalcuable. This research included the increase in yield of penicillin through improvement of the nutrient solution in which the mold that produces penicillin is grown, the development of a submerged culture method for its growth, and the isolation of higher yielding strains. Commercial production of penicillin in 1941 was nil; in 1948 production in the United States reached a monthly total of more than 8 trillion units. The wholesale value of the penicillin produced in 1947 was about 150 million dollars.

Fungal amylase.- In the production of alcohol from grain, the starch in the grain must first be converted to sugar. Malt, obtained mainly from barley, is generally used to effect the conversion. A process has been developed at this Laboratory by which fungal amylase, the product of the mold *Aspergillus niger*, can be grown in submerged culture and used to replace malt, with subsequent lowering of the cost of producing industrial alcohol from grain.

Starch and gluten from wheat.- The discovery and development of the Batter Process for producing starch and gluten from wheat flour solved in large part the acute need for these materials during the war years. The starch produced by this process was converted into sirups, dextrose sugar, and industrial alcohol for synthetic rubber. The gluten was converted largely into flavoring agents for foods supplied the military forces. In one year the industrial operation of the process utilized 300 million pounds of low-grade wheat flour, then in plentiful supply, to make products valued at more than 30 million dollars.

Textile fibers from zein.- A continuous process developed at this Laboratory for producing a textile fiber from the corn protein, zein, is the basis of a commercial process which is now being used to produce this fiber. This fiber found early use in the manufacture of felt for a well-known brand of men's hats. The fiber is superior in dry and wet strengths and in resiliency to other available artificial protein fibers.

"Norepol" and "Norelac".- Research on soybean oil during the war years led to the production of approximately 1.5 million pounds of "Norepol," a rubber substitute. This development helped augment the supply of rubber replacements in 1942-43. Fundamental research showed that a truly synthetic rubber could be manufactured from soybean oil in an emergency.

Extension of this research brought the development of "Norelac," a new synthetic resin which is now in commercial production. It is used mainly as a heat-sealing agent in the packaging of foods.

Improved soybean oil paints.- Research on ingredients in soybean oil paints has led to the development of improved exterior paints for farm and industrial buildings. By proper pigmentation, the durability and speed of drying of soybean oil paints have been considerably improved. One recent discovery is that calcium oxide (powered quicklime), when added to outside white house and barn paints made with soybean oil, produces coatings that are free from residual tack and after-tack, collect less dirt, do not discolor, and have improved durability.

Oil content of soybeans.- During the three seasons, 1943-45, the Commodity Credit Corporation, a Government agency, marketed the nation's entire soybean crop. The price at which the soybeans were sold to processors was based on oil content. If analytical errors had resulted even in very small deviations below the actual oil content of the beans, the Government would have sustained a large loss. Standardization of analytical methods and assistance to commercial and industrial analytical chemists, furnished by chemists of the Laboratory, resulted in a savings of about 5 million dollars to the Government during this period.

Protein adhesive for shotgun-shell casings.- In 1948 approximately half the shotgun shells manufactured in this country had the laminated paper used for their casings glued with an adhesive made from soybean protein. The formula for the adhesive, developed at this Laboratory, was the answer to the need for a more plentiful and cheaper adhesive than had been formerly used. As a result of both shooting and aging tests, the casings made with soybean adhesive were reported equal or superior to the shells made previously.

Gelable protein.-"Gelsoy," a new protein product made from soybeans, has been developed at this Laboratory. Gelsoy dissolves in water and gelatinizes when heated. It has many potential uses in food and adhesive specialities. Its bland flavor and gelling characteristics indicate several possible applications in the food field, such as for soups, cooky and ice cream fillers, puddings, and protein enrichment of pastry products and candy. Gelsoy also has excellent whipping properties, similar to egg white, for use as a meringue.

Soft-grit blasting.- In cooperation with the Navy, and at their request, a new method for cleaning airplane engines by air-blasting with materials which do not scratch, erode, or cause dimensional changes of parts was developed. The blasting material was composed of 60 percent ground corncobs and 40 percent whole rice hulls. This method saved the Navy about 250 thousand dollars during the war, since it shortened the time required to clean an engine and eliminated use of valuable corn grits for this purpose. The method is finding increasingly wide civilian uses in the automotive, glass, rubber, and other industries. Laboratory studies have shown also that ground English and black walnut and pecan shells, and certain fruit pits, with or without rice hulls, are efficient soft-grit blasting materials.

Improved wheat straw pulps.- The possible shortage of timber for pulp production and the desirability of utilizing the large quantity of wheat straw which is burned or wasted in this country each year has brought wide attention to the research on straw pulping methods conducted at this Laboratory. One development is a method which makes straw pulp exceptionally well suited for the production of fine and specialty papers. Such pulp has been shown also to produce excellent newsprint when blended with wood pulp. A second development has been the preparation of straw pulp by which insulating boards can be produced that have exceptional impact strength and other qualities equal or superior to insulating boards made from wood pulp. A third development has been improved chemical and physical treatments for preparing pulp for corrugating paper and paper board, by which improved products can be made at lower cost and in shorter time.

Process for producing sugars from agricultural residues.- A continuous process for producing five- and six-carbon sugars, principally from corncobs, and converting these sugars into useful organic chemicals, such as alcohol, acetone, and furfural, has been developed. This process is being tested on a semi-industrial scale to determine its practicability.

Patents.- Many processes, and especially processing steps, developed here are patentable. Inasmuch as the funds for this research come from the Government, such developments belong to the public, and all patents obtained are therefore assigned to the Secretary of Agriculture who is authorized to grant free licenses to anyone qualified to use them. Between 1941 and the start of 1949, more than 160 applications for patents had been filed by the Northern Laboratory. Fifty patents have been granted, and many were still pending as of January 1, 1949.

GENERAL INFORMATION ABOUT THE FOUR REGIONAL RESEARCH LABORATORIES

Laboratory	Director	Mailing address	Area served	Commodities studied
Northern	R. T. Milner	825 North University St., Peoria 5, Illinois	Ill., Ind., Iowa Kans., Minn., Mo., Nebr., N. Dak., Ohio, S. Dak., Wis., Mich.	Agricultural Residues; Corn, Wheat, and other ceral crops; soybeans, and other oilseed crops.
Southern	W.M. Scott	2100 Robert E. Lee Blvd. New Orleans 19, La.	Ala., Ark., Fla., Ga., La., Miss., Okla., S.C., Tex.	Cotton, Sweetpotatoes; Peanuts; and Rice.
Eastern	P.A. Wells	Philadelphia 18, Pa.	Conn., Del., Maine, Ky., Md., Mass., N.H., N.J., N.Y., N.C., Pa., R.I., Tenn., Vt., Va., W. Va.	Apples and other Eastern deciduous fruits; vegetables; tobacco; milk products; animal fats and oils; Potatoes; hides, Tanning materials and Leather; Honey; maple products; and wool by-products.
Western	M.J. Copley	800 Buchanan Street, Albany 6, Calif.	Ariz., Calif., Colo., Idaho, Mont., Nev., N. Mex., Oreg., Utah, Wash., Wyo.	Fruits; vegetables; Poultry products; Alfalfa; wheat; apples; potatoes; rice; and wool.

U. S. DEPARTMENT OF AGRICULTURE
SEP 12 1949
RECEIVED